

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Specification

2. The disclosure is objected to because of the following informalities. Appropriate correction is required.

Regarding **equation 2**, it is suggested that variables g and b switch places such that variable g has coefficient +1 and variable b has coefficient -2 such that equation 2 is consistent with equation 1.

Claim Objections

3. **Claim 2** objected to because of the following informalities. Appropriate correction is required.

Regarding **claim 2**, the following amendment is suggested "is a second ~~weigh~~weight given to the green color value".

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. **Claims 22,25** rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding **claims 22,25**, a method executed by a computer or firmware implemented in software that is not stored on a computer or firmware readable medium is non-statutory subject matter. It is suggested to limit the software to be stored on a computer or firmware readable medium

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. **Claims 1-2,22** rejected under 35 U.S.C. 103(a) as being unpatentable over
- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2).

Regarding **claim 1**, Luo discloses a method for removing a red eye from an image, comprising: calculating a weighted red value for each pixel in the image based on (1) red, green, and blue color values (pg. 3 [0061-0064] – equation 1 teaches a weighted red value from red, green, and blue, normalized by a total pixel energy); selecting a plurality of pixels in the image having weighted red values greater than a threshold as red eye pixels 88 (fig. 9, pg. 4 [0065-0072]); and correcting the red eye pixels to remove the red eye from the image (pg. 1 [0009], pg. 10 [0128-0129]).

Luo does not expressly disclose based on (2) a luminance of each pixel in the image.

loffé discloses a red eye detection method comprising a step to enhance red eye detection by normalizing each pixel by dividing by the average luminance (col. 4 lines 25, 30-31 – average luminance being based on luminance of each pixel). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the equation to obtain a weighted red value by normalizing by pixel energy as taught by Luo to rather try normalizing by luminance as taught by Ioffé because it would have constituted a substitution of old elements, the combination yielding no more than one would expect from such an arrangement.

Regarding **claim 2**, Luo as viewed discloses the method of claim 1, wherein said calculating comprises: $f = c_1(1)r + c_2(1)g + c_3(1)b$, wherein f is the weighted red value, r is the red color value, g is the green color value, b is the blue color value, $c_{1,1}$ is a first weight given to the red color value, $c_{2,1}$ is a second weight given to the green color value, $c_{3,1}$ is a third weight given to the blue color value, and Y is the luminance (Luo pg. 3 [0061-0062]).

Regarding **claim 22**, Luo as viewed discloses the method of claim 1, wherein the method is implemented in software executed by a computer or firmware embedded into digital cameras, printers, scanners, or mobile phones (Luo fig. 2, pg. 1 [0006], pg. 2 [0051-0052], Hardeburg col. 3 lines 45-58).

8. **Claim 4** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
- as applied to claim 2, and further in view of
- iii. Jarman (US 2004/0240747 A1).

Regarding claim 4, Luo as viewed does not expressly disclose claim 4.

Jarman discloses a red eye detection and correction method comprising the method of claim 2, prior to said correcting, further comprising: calculating another weighted red value for each pixel in the image from the red, the green, the blue color values, and the luminance of each pixel in the image, comprising: $15 f_2 = c_1 (2) r + c_2 (2) g + c_3 (2) b Y$, wherein $f_{2.sub.2}$ is said another weighted red value, $c_{1.sup.(2)}$ is another first weight given to the red color value, $c_{2.sup.(2)}$ is another second weight given to the green color value, and $c_{3.sup.(2)}$ is another third weight given to the blue color value; and selecting another plurality of pixels in the image having another weighted red values greater than another threshold as additional red eye pixels (figs. 2-9, pg. 4 [0086-0091] – red, green and blue values are used to compute HSL values; In Pass 1, three types of red eye are detected with associated saturation and lightness levels including variations of the color red such as pink). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous red eye detecting algorithm to check for more than one type of red eye using red weighted values specific to each type as taught above by Jarman in order to more fully detect red eye (pg. 1 [0007]).

9. **Claims 6,9-10,13,18** rejected under 35 U.S.C. 103(a) as being unpatentable over
- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
- as applied to claim 1, and further in view of
- iii. DeLuca (US 7,042,505 B1).

Regarding **claim 6**, Luo as viewed does not expressly disclose claim 6.

DeLuca discloses a red eye detection and correction method comprising the method of claim 1, prior to said correcting, further comprising: grouping a plurality of red eye pixels that are contiguous into a red eye region (col. 3 line 67); determining if the red eye region comprises a substantially round pupil (fig. 3, col. 3 lines 19-23); and rejecting the plurality of red eye pixels when the red eye region does not comprise a substantially round pupil (col. 4 lines 4-5, 11-13). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous red eye verification to also verify if the current red eye region round as taught above by DeLuca in order to aid in "eliminating red-eye phenomenon" (col. 6 line 29).

Regarding **claim 9**, DeLuca discloses the method of claim 6, further comprising: determining if the red eye region is too close to another red eye region formed by grouping another plurality of red eye pixels that are contiguous 410; and rejecting the plurality of red eye pixels when the red eye region is too close to said another red eye region 415 (fig. 10, col. 4 lines 14-27).

Regarding **claim 10**, DeLuca discloses the method of claim 9, wherein said determining if the red eye region is too close to another red eye region comprises: determining if a geometric center of the red eye region is within a range of distances of another geometric center of said another red eye region, wherein the range of distances is proportional to a pupil radius of the red eye region (fig. 10, col. 4 lines 14-27 – the radius of the grouping involves determining a geometric center, proportional by 2 to 5 times).

Regarding **claim 13**, DeLuca discloses the method of claim 9, further comprising: determining if the red eye region is proximate to a facial region; and rejecting the plurality of red eye pixels when the red eye region is not proximate to a facial region (col. 4 lines 21, 29, 33, 46, 14-46).

Regarding **claim 18**, DeLuca discloses the method of claim 13, further comprising: determining if the red eye region is proximate to a sclera; and rejecting the plurality of red eye pixels when the red eye region is not proximate to a sclera (fig. 6, col. 4 lines 21-44).

10. **Claim 7** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
- ii. Ioffe (US 7,343,028 B2)

- iii. DeLuca (US 7,042,505 B1)
as applied to claim 6, and further in view of
- iv. Hanna (US 6,714,665 B1).

Regarding **claim 7**, Luo as viewed does not expressly disclose claim 7.

Hanna discloses a pupil detection method comprising the method of claim 6, wherein said determining if the red eye region comprises a substantially round pupil comprises: determining a geometric center of the red eye region; for each radius in a range of radii, determining a difference between (1) weighted red values of red eye pixels located at a radius and at a range of angles about the geometric center and (2) weighted red values of red eye pixels located at a next radius in the range of radii and at the range of angles; selecting one radius in the range of radii that provides a largest difference as a pupil radius for the red eye region; determining a first ratio of (1) a first number of red eye pixels located in a circle having the pupil radius to (2) an area of the circle; determining a second ratio of (1) a second number of red eye pixels in a ring having an inner radius of the pupil radius and an outer radius of a maximum radius in the range of radii to (2) an area of the ring; and determining a difference between the first ratio and the second ratio, wherein the red eye region does not comprise a substantially round pupil when the difference is less than a threshold (fig. 22b, col. 48 lines 30- 63). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous red eye region validation to further verify region roundness as taught above by Hanna in order to require no involvement by object in the image (col. 1 lines 67).

11. **Claim 8** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
 - iii. DeLuca (US 7,042,505 B1)
 - iv. Hanna (US 6,714,665 B1)
- as applied to claim 7, and further in view of
- v. Gaubatz (US 7,155,058 B2).

Regarding **claim 8**, Gaubatz as further viewed (refer to the rejection of claim 11) discloses the method of claim 7, wherein the range of radii ranges from 0.5 to 1.5 times a distance from the geometric center to a farthest red eye pixel in the red eye region (fig. 8, 9 – on graph pixel 4 being the farthest red eye pixel the radi considered range from 2-6, .5 to 1.5 times 4).

12. **Claim 11** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
 - iii. DeLuca (US 7,042,505 B1)
- as applied to claim 10, and further in view of
- iv. Gaubatz (US 7,155,058 B2).

Regarding **claim 11**, Luo as viewed does not expressly disclose claim 11.

Gaubatz discloses a red eye detection and correction method comprising the method of claim 10, further comprising determining the pupil radius as follows: determining the geometric center of the red eye region (fig. 8 – point 0); for each radius in a range of radii, determining a difference between (1) weighted red values of red eye pixels located at a radius and at a range of angles about the geometric center and (2) weighted red values of red eye pixels located at a next radius in the range of radii and at the range of angles; and selecting one radius in the range of radii that provides a largest difference as a pupil radius for the red eye region (fig. 8, 9, col. 15 lines 18-57 – difference is found when computing min and greater than). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous red eye region validation to proper discard pixels outside of an appropriate pixel radius as taught above by Gaubatz in order to do red eye correction efficiently (Gaubatz col. 2 lines 40-43).

13. **Claim 12** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
- ii. Ioffe (US 7,343,028 B2)
- iii. DeLuca (US 7,042,505 B1)
- iv. Gaubatz (US 7,155,058 B2)

as applied to claim 11, and further in view of

- v. Gallagher (US 2005/0196067 A1).

Regarding **claim 12**, Luo as viewed does not expressly disclose claim 12.

Gallagher discloses a red eye detection and correction method comprising the method of claim 11, wherein the range of distances comprises 10 to 14 times the pupil radius (pg. 6 [0083-0094] — $Rd \cdot T3$ is equivalent to multiples of the pupil radius). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous pupil radius selection to consider ranges as taught above by Gallagher in order to be more responsive to red region grouping situations (Gallagher pg. 1[0010]).

14. **Claim 14** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
 - iii. DeLuca (US 7,042,505 B1)
- as applied to claim 13, and further in view of
- iv. Luo1 (US 7,035,461 B2).

Regarding claim 14, Deluca further discloses the method of claim 13, wherein said determining if the red eye region is proximate to a facial region comprising: in a ring having an inner and outer radii proportional to a pupil radius of the red eye region (col. 4 lines 12-16); rejecting the plurality of red eye pixels if the most common color in the red eye region is not within the range of the threshold skin colors.

Luo as viewed does not expressly disclose generating a histogram for pixels S4a-d (fig. 3); selecting a most common color value in the histogram S4e; comparing the most common color to a range of threshold skin colors S4i-j.

Luo1 discloses a red eye detection and correction method comprising generating a histogram for pixels S4a-d (fig. 3); selecting a most common color value in the histogram S4e; comparing the most common color to a range of threshold skin colors S4i-j. At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous red eye region verification process to further detect facial regions by the histogram method taught above by Luo1 in order to improve face region detection (Luo1 col. 2 lines 5-6).

15. **Claim 15** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
 - iii. DeLuca (US 7,042,505 B1)
 - iv. Luo1 (US 7,035,461 B2)
- as applied to claim 14, and further in view of
- v. Chen (US 6,895,112 B2).

Regarding **claim 15**, Luo as viewed does not expressly disclose claim 15.

Chen discloses a red eye detection method comprising the method of claim 14, wherein said comparing comprises comparing the most common color value in HSV color space to the range of threshold skin colors in HSV color space (col. 3 lines 34-51). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous red eye region detection method to further carry out skin tone

comparison in the HSV color space in order to ensure accuracy when identifying pixels that are of skin color (Chen col. 3 lines 36-38).

16. **Claim 16** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
 - iii. DeLuca (US 7,042,505 B1)
 - iv. Luo1 (US 7,035,461 B2)
- as applied to claim 14, and further in view of
- v. Gaubatz (US 7,155,058 B2).

Regarding **claim 16**, Luo as further viewed (refer to the rejection of claim 11) discloses the method of claim 14, further comprising determining the pupil radius as follows: determining a geometric center of the red eye region (fig. 8 point 0); for each radius in a range of radii, determining a difference between (1) weighted red values of red eye pixels located at a radius and at a range of angles about the geometric center and (2) weighted red values of red eye pixels located at a next radius in the range of radii and at the range of angles; and selecting one radius in the range of radii that provides a largest difference as a pupil radius for the red eye region (Gaubatz fig. 22b, col. 48 lines 30- 63).

17. **Claim 17** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of

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- ii. Ioffe (US 7,343,028 B2)
- iii. DeLuca (US 7,042,505 B1)
- iv. Luo1 (US 7,035,461 B2)
- v. Gaubatz (US 7,155,058 B2)

as applied to claim 16, and further in view of

- vi. Gallagher (US 2005/0196067 A1).

Regarding claim 17, Luo as further viewed (refer to the rejection of claim 12) discloses the method of claim 16, wherein the inner and outer radii comprises of 4 to 9 times the pupil radius (Gallagher pg. 5 [0073-0081] – $R_d \cdot T3$ is equivalent to multiples of the pupil radius).

18. **Claim 19** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
- ii. Ioffe (US 7,343,028 B2)
- iii. DeLuca (US 7,042,505 B1)

as applied to claim 18, and further in view of

- iv. Gupta (US 6,204,858 B1).

Regarding **claim 19**, Luo as viewed does not expressly disclose claim 19.

Gupta discloses a red eye detection and correction method comprising the method of claim 18, wherein said determining if the red eye region is proximate to a sclera comprises: generating a luminance histogram for pixels in a ring having an inner and outer radii proportional to a pupil radius of the red eye region; selecting a brightest

color in the luminance histogram; determine a ratio between a number of pixels in the ring having the brightest color to a number of red eye pixels within a circle having the pupil radius; and rejecting the plurality of red eye pixels when the ratio is less than a threshold (fig. 2, 8, col. 2 line 62, col. 4 lines 42-59). At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the previous as taught above by Gupta in order to aide in the automation of red eye detection (Gupta col. 2 lines 19-21).

19. **Claims 20-21** rejected under 35 U.S.C. 103(a) as being unpatentable over

- i. Luo (2005/0047656 A1) in view of
 - ii. Ioffe (US 7,343,028 B2)
 - iii. DeLuca (US 7,042,505 B1)
 - iv. Gupta (US 6,204,858 B1)
- as applied to claim 19, and further in view of
- v. Gaubatz (US 7,155,058 B2).

Regarding **claim 20**, Luo as further viewed (refer to the rejection of claim 11) discloses the method of claim 19, further comprising determining the pupil radius as follows: determining a geometric center of the red eye region (fig. 8 point 0); for each radius in a range of radii, determining a difference between (1) weighted red values of red eye pixels located at a radius and at a range of angles about the geometric center and (2) weighted red values of red eye pixels located at a next radius in the range of radii and at the range of angles; and selecting one radius in the range of radii that

provides a largest difference as a pupil radius for the red eye region (Gaubatz fig. 22b, col. 48 lines 30- 63).

Regarding **claim 21**, Gaubatz discloses the method of claim 20, wherein the inner and the outer radii comprises 2 to 5 times the pupil radius (fig. 8, 9 – considering a default pupil radius of 1).

Allowable Subject Matter

20. **Claims 3,5** objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. **Claim 23-24** allowed.

22. **Claim 25** would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 101, set forth in this Office action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL SAUNDERS whose telephone number is (571)270-3319. The examiner can normally be reached on Mon-Thur 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NgocYen Vu can be reached on 571.272.7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PS/
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